R&D/MGD Workshop: Informed use of space-based biomass data in MRV procedures
Potsdam, 23-25 October 2024

Background

Over the last few years there has been a surge in the availability of space-based aboveground biomass estimates. This is the result of many years of advancement in remote sensing technologies by organizations, scientists and national institutions around the world. These new datasets thus open up the possibility of their utilization in national forest monitoring reporting and verification (MRV) procedures.

The use of space-based biomass data is briefly mentioned in the 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas (GHG) Inventories[1]. To elaborate on this, the latest GFOI guidance (v.3) supports this addition by listing few options in which space-based biomass data can assist national MRV procedures. However, at the time of refining the IPCC guidelines or elaborating the aforementioned GFOI guidance, the number of existing applications were very limited, and guidance on the operational considerations behind the use of these data were lacking.

Between then and now, focused research on the use of space-based biomass data for MRV purposes has been carried out. This includes research on integration techniques of biomass data with national forest inventory (NFI) data. In addition, dedicated workshops carried out in Latin America, Africa and Asia have introduced the latest research in space-based biomass data to national forest monitoring country teams and received feedback on the main challenges behind the informed use of space-based biomass data. Furthermore, a dedicated GFOI R&D coordination meeting, a GFOI joint components meeting in 2023 and an expert workshop in March 2024 have gathered insights from country MRV specialists, GHG reporting experts, national forest monitoring teams, biomass map producers and statisticians on the methods behind the integration of biomass data with NFIs for policy-level reporting. Furthermore, dedicated GFOI efforts are underway to systematically survey national MRV specialists on the opportunities of and barriers to the use of space-based biomass data within their national forest monitoring systems (NFMS) and related processes.

The GFOI R&D Component, financed by ESA and with support from the broader GFOI community brought together MRV specialists, NFMS country teams, and biomass data experts to discuss and synthesize the considerations behind the use of space-based biomass data for MRV purposes. This was done as part of the broader GFOI efforts, particularly by the Methods and guidance Component, to jointly develop comprehensive guidance regarding the use of biomass maps for MRV.

Workshop objectives:

1. **Provide an updated perspective of the needs and developments related to improving forest biomass estimations**
   Present an updated perspective on the needs and developments related to improving estimations of forest biomass by NFMS in tropical countries, based on the GFOI Biomass User Survey and latest examples of country applications, and discuss how these insights can clarify the use of space-based biomass data for the enhancement or enabling of MRV procedures while complying with predefined requirements.
2. **Develop a draft of supporting guidance on the use of space-based biomass data for MRV purposes**
   Based on ongoing GFOI efforts and updated perspectives in Objective 1, contribute to the development of the MGD Biomass Maps Module for MRV processes.
3. **Identify and plan next steps**
   Develop an outline of the steps forward to finalize guidance and next steps in country engagement for research activities, assign responsible contributors and set timelines.

[1] https://www.ipcc-nggip.iges.or.jp/public/2019rf/pdf/4_Volume4/19R_V4_Ch02_Generic Methods.pdf

Location

The workshop was held in the WIS Education Forum, Am Kanal 47, 14467 Potsdam, Germany and online.

Organizers

Daniela Requena Suarez, Martin Herold (GFOI R&D/GFZ), Carly Green and Thomas Harvey (GFOI), Javier Garcia-Perez (FAO), Naikoa Aguilar Amuchastegui (WB), Sylvia Wilson (USGS), Frank Martin Seifert (ESA), Natalia Málaga (GFZ) and Neha Hunka (UMD).

Funding

This workshop was made possible through financial support from the Global Forest Observations Initiative (GFOI), and European Space Agency (ESA), including its contributions to the GFOI R&D Coordination and the Climate Change Initiative (CCI) Biomass project.

Detailed Agenda

Wednesday, October 23, 2024

Session	Presentation/Discussion	Presenter(s)	Time (CEST)
Session 1 Setting the Scene: GFOI and IPCC Requirements	Registration, morning coffee, Meet and Greet	-	8.30-9.00
	Welcome and Introductions	Daniela Requena, Martin Herold, Frank Martin Seifert	9.00-9.30
	Introduction to the GFOI	Ellie Peneva-Reed	9.30-9.45
	Framing space-based biomass estimations within IPCC good practice requirements	Sandro Federicci	9.45-10.15
	Assessing the need and use of biomass maps for MRV	Joana Melo	10.15-10.30
Coffee break			10.30-11.00
Session 2 Setting the Scene: Country User Feedback and Research Updates	Summary of GFOI User Survey on Biomass Products	Daniela Requena	11.00-11.30
	GFOI R&D Component Updates on Biomass/EF estimations	Neha Hunka, Natalia Málaga, Chad Babcock	11.30-12.15
Lunch break			**12.15-13.30**
Session 3 Country Experiences in Biomass Monitoring: Experiences, challenges and opportunities	EO based initiatives in the Philippines	Larlyn Faith Aggabao	13.30-14.00
	Peru experiences in biomass monitoring: experiences, challenges and opportunities	Jorge Carranza, Alexs Arana, Ricardo De la Cruz	14.00-14.30
	Mozambique experiences in biomass monitoring	Muri Soares, Hercilo Odorico	14.30-15.00
	GFOI Guidance on use of biomass maps in MRV and CALM	Carly Green	15:00-15:30
Coffee Break			**15:30-16:00**
Session 5 First joint session **(16:00-17:30)**	**First joint session to discuss group allocation, topics to be covered and changes/additions to be made after the morning and early afternoon sessions.**		
	Group 1: Country Experiences with the aim of creating case studies Work on case studies addressing the main themes selected for the guidance **(Where?)**	**Group 2: Design Decisions** Discuss considerations behind the potential final uses of space-based biomass products **(What for?)**	**Group 3: Methodological Guidance** Consolidate the guiding frameworks behind the potential uses **(How?)**

Thursday October 24, 2024

Session 6 Parallel working sessions to develop guidance aligned with MGD topics/chapters/sections	**Presentation/Discussion**	**Presenter**	**Time (CEST)**
	Joint Discussion Session on Group 2: Design Decisions (**What for?**)		9.00-10:30
Coffee break			**10.30-11.00**
Session 7 Space-based Biomass Data Updates	CCI Biomass Update	Maurizio Santoro	11.00-11.30
	GEDI Update	Neha Hunka	11.30-12.00
Lunch break			**12.00-13.30**
Session 8 Parallel working sessions to develop guidance aligned with MGD topics/chapters/sections Main task: begin writing	Parallel Sessions	*Participants can move around groups*	13.30-15.00
	Group 1: Country Experiences	**Group 2: Design Decisions**	**Group 3: Methodological Guidance**
Coffee Break			**15.00-15.30**
Session 9 Parallel working sessions to develop guidance aligned with MGD topics/chapters/sections	**Recap Session (all groups)**		15.30-17.00

Friday October 25, 2024

Session	**Presentation/Discussion**	**Presenter(s)**	**Time (CEST)**
Session 10 Parallel working sessions: *Moderator: Carly Green*	**Discussion Session (people mix!)** Core issues, knowns and unknowns discussed to encourage cross cutting issues to be explored		9.00-10:30
	Country examples (Group 1) and Methods and Guidance (Group 3) work together on document outline	Design-group (Group 2) refine the decision tree.	
Coffee break			10.00-10.30
Session 11 Joint session: Discussion on Guidance content and structure	Joint session, feedback on decision tree and document outline. Wrap up allocated tasks and work plans for future work in preparation for last session co-ordination.		10.30-12.30
Lunch break			**12.30-13.30**
Session 12 Wrapping up and next steps *Moderator: Martin Herold*	**Discussion session 6:** Finalizing next steps and setting deadlines for review	All	13.30-15.00

Summary

The main objective of **Day 1** was to establish a common baseline of understanding among participants, through a series of "Setting the Scene" sessions. These sessions comprised of presentations related to the opportunities and challenges behind the use of space-based biomass data in the context of National GHG Inventories, measurement, reporting and verification to the UNFCCC, biomass user survey results as well as research advancements and country-led efforts to improve biomass monitoring in the Philippines, Peru and Mozambique. Following this, a presentation on the rationale behind the need to develop GFOI guidance on the use of biomass maps was provided. Key takeaways in Day 1 include:

- When using space-based biomass data in support of GHG reporting purposes, consistency among the various data sources and models concerning definitions (forest, biomass pools), geolocation and, spatial and temporal data characteristics should be taken into consideration. (Session 1)
- The estimation of biomass change directly from multi-temporal space-based biomass data has not been achieved so far for NGHGIs. (Session 1)
- Good practice for NGHGI MRV processes outlined in the 2019 IPCC Refinement do not limit countries from using their own space-based biomass data. (Session 1)
- The development, handling and provision of space-based biomass data must take into consideration the end users, in this case the NGHGI community. (Session 1)
- Making changes in a NGHGI and embracing new products/technologies require high investment in time and effort, and require re-calculating historic emissions in previous reports. (Session 2)
- From the Biomass User Survey results, there is a clear need for guidance and capacity building for evaluating the need and use of such datasets. (Session 2)
- Within national efforts, there are challenges in the implementation of NFIs thus space-based biomass data may be of use for increasing precision or predicting biomass estimates in inaccessible areas. (Session 3)
- High-resolution biomass estimates (such as those derived from near-sensing technologies) can produce high-quality biomass estimates, but methods are costly, have challenges in upscaling, and require complex processing and long-term storage capabilities (Session 3)
- MGD oversees the development of guidance and rapid response modules, providing pathway solutions to specific needs/questions. (Session 4)
- The Criteria for consistently assessing levels of maturity (CALM) can aid with the assessment of the operational status of technologies/methods aimed to support decision making related to investments in new technologies and prioritization of guidance development by the MGD Component. (Session 4)
- One of the workshop's aims is to work jointly on the provision of guidance on the use of space-based biomass data, and ideally a decision tree to support the informed consideration of these datasets for NGHGI and REDD+ reporting in consideration of IPCC Guidelines. (Session 4)

During **Day 2** participants started working on the topics to be covered in the rapid response module, as well as discussing the framework behind the decision tree to be included therein. For this, three groups were defined:

- **Group 1: Country Experiences**
  Task: identify case studies which make use of space-based biomass data (and their level of operationality), reframe methodological guidance outline to existing national needs
  Facilitators: Daniela Requena and Javier Garcia-Perez
- **Group 2: Design Decisions**
  Task: formulate the pathway of methodological considerations for using space-based biomass data in favor of enhancing biomass stocks for emission factors. This to be done as a decision tree.
  Facilitators: Natalia Málaga and Martin Herold
- **Group 3: Methodological Guidance**
  Task: consolidate the content of the rapid response module, aligned with the existing GFOI MGD, IPCC good-practice guidelines for GHGIs, and existing national needs.
  Facilitators: Carly Green and Naikoa Aguilar

Prior to working in parallel working sessions, a joint session was held at the beginning of Day 1 to formulate the considerations for Group 2: Design Decisions. These considerations were pivotal for refining the motivations behind the potential use of these developing data sources. Working on answering the "*what for?"* (Group 2) contributed towards establishing a starting point for the discussion behind *"where?"* (Group 1) and

"how?" (Group 3) in the afternoon. Additionally, Session 7 on Space-based biomass data updates provided an overview of the current status of CCI Biomass and GEDI datasets, including considerations regarding their continued availability, key for their integration and guaranteeing consistency over time.

Afternoon discussions were held separately among working sessions. At the end of the day, there was a joint session for group recaps. An initial version of the decision tree was presented for initial feedback from all participants.

The objective of **Day 3** was to reach agreement on the content of the rapid response module to be developed and plan for next steps for MGD and R&D efforts. Groups 1 and 3 had a joint working session to include insights from existing national efforts and needs to the module outline. Group 2 finalized the first draft of the decision tree and shared it with all workshop participants (Figure 1).

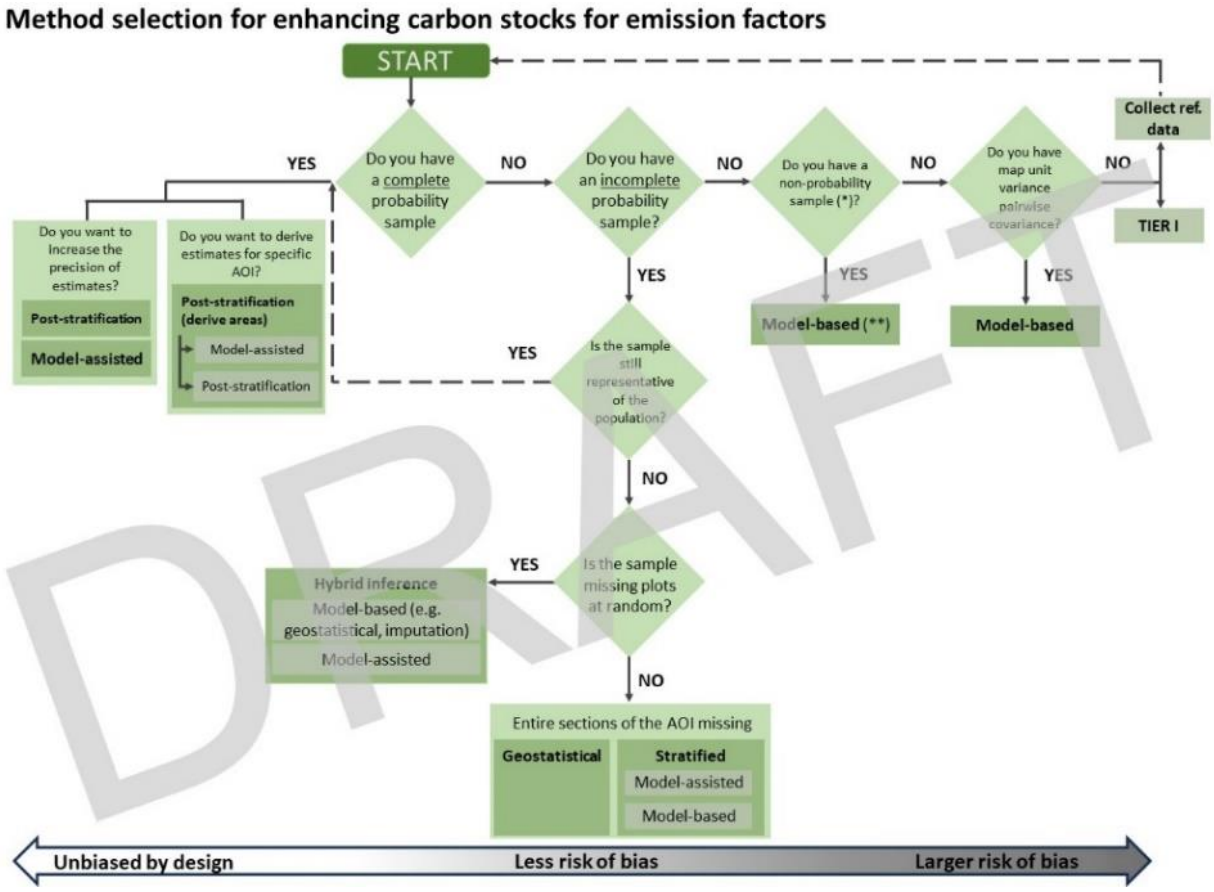


Figure 1. First draft of decision tree elaborated by Group 2 during the workshop (Credit: Group 2)

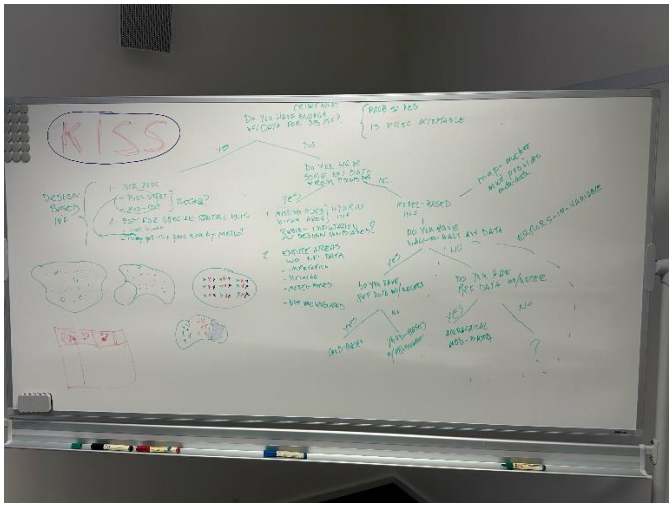
Following the discussions regarding the document outline and decision tree, the following **next steps** were agreed upon:

Develop/finalize rapid response module (Lead: MGD)	• Workplan and circulation of document: 1-2 weeks from workshop ○ MGD to circulate guidance outline with writing assignments • Update telecon in December, and dedicated group meetings about sections. • Link to Capacity Building component in coordination with R&D component Deadline 1: 2025 Q1 for **first complete draft** Deadline 2: **final version for review** by June 2025, presentation at GFOI plenary (Q4 2025)
Present module and solicit feedback (Lead: R&D)	• Preparation of meeting summary and slides, summarize workshop process and outcomes • Scientific conferences: abstracts for AGU, ESA-LPS, ForestSAT in 2026 • Once there is guideline draft, feedback from countries and verifiers

R&D/country demonstrations
 	
(Lead: R&D)
	• Methods-focused R&D case on re-calibrating maps and errors (Neha, Erik, Chad and Ron)
	• Continued engagement with countries for research demonstrations for different parts of the decision tree and comparisons: Peru, Mozambique, Mexico, Philippines, Sudan… (application-focused)
	• Next R&D steps:
	  ○ Quantification of removals (Biomass change): research and potential next expert meeting for additional guidance
	  ○ Continued work on ground/satellite data integration pathways
	  ○ Explore opportunities and challenges of emerging AI-based methods
	• Development of examples in GitHub repo (GFOI-led)

Role for space-based biomass data providers	• Improvement and update space-based biomass estimates • Increased engagement in country case studies • Continue enhancing ongoing cases like in Peru, Mozambique and Mexico • Updated, easy documentation for key datasets (for example, FAQs for Reviewers/Verifiers, necessary metadata lists, 2-pager summaries) ← Carly and Naikoa can provide input for what information is needed • Guarantee transparency, and open-source practices

Workshop photos



Participant list

	Participant	Institute	Attendance
1	Daniela Requena Suarez	Helmholtz Center Potsdam GFZ	In-person
2	Martin Herold	Helmholtz Center Potsdam GFZ	In-person
3	Natalia Málaga	Helmholtz Center Potsdam GFZ	In-person
4	Carly Green	Global Forests Observations Initiative (GFOI) Office	In-person
5	Naikoa Aguilar Amuchastegui	World Bank	In-person
6	Javier Garcia Perez-Gamarra	Food and Agriculture Organization FAO	In-person
7	Frank Martin Seifert	European Space Agency ESA	In-person
8	Ake Rosenqvist	SoloEO and Japan Aerospace Exploration Agency	Online
9	Neha Hunka	University of Maryland	In-person
10	Muri Soares	FNDS, Mozambique	In-person
11	Hercilo Odorico	FNDS, Mozambique	In-person
12	Ricardo de la Cruz Paiva	SERFOR, Peru	In-person
13	Alex Arana	SERFOR, Peru	In-person
14	Jorge Carranza	SERFOR, Peru	In-person
15	Maurizio Santoro	Gamma Remote Sensing	In-person/Online
16	Erik Næsset	Norwegian University of Life Sciences	In-person
17	Ronald McRoberts	University of Minnesota	In-person
18	Sandro Federici	IPCC TFI Technical Suport Unit	Online
20	Arnan Araza	Wageningen University and Research	In-person
21	Erik Lindquist	Food and Agriculture Organization FAO	Online
22	Andreas Vollrath	Food and Agriculture Organization FAO	Online
23	Chad Babcock	University of Minnesota	In-person
24	Jingjing Liang	Purdue University and Food and Agriculture Organization FAO	In-person
25	Ellen Bruzelius Backer	Norway's International Climate and Forest Initiative NICFI	In-person/Online
26	Ellie Peneva-Reed	Global Forests Observations Initiative (GFOI) Office	In-person
27	Larlyn Faith Aggabao	FMB, Philippines	Online
	Camilo Ospina	Helmholtz Center Potsdam GFZ	In-person
29	Debayan Chatterjee	Helmholtz Center Potsdam GFZ	In-person
30	Alexandra Runge	Helmholtz Center Potsdam GFZ	In-person
31	Maria Fernanda Jaramillo	Global Forests Observations Initiative (GFOI) Office	In-person
32	Viola Heinrich	Helmholtz Center Potsdam GFZ	In-person
33	Ruben Valbuena	Swedish University of Agricultural Sciences SLU	In-person